

Defense Advanced Research Projects Agency



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# High-speed modulator for links with net RF gain

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# Coupling regimes and their control in resonators

Kerry Vahala  
Caltech

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# Outline

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- **Taper-coupled WGM resonators.**
- **Coupling regimes in wave guide resonator systems.**
- **Illustration of regimes in double taper system.**
- **Variation of coupling regime.**
- **Illustration of variation in single taper system.**

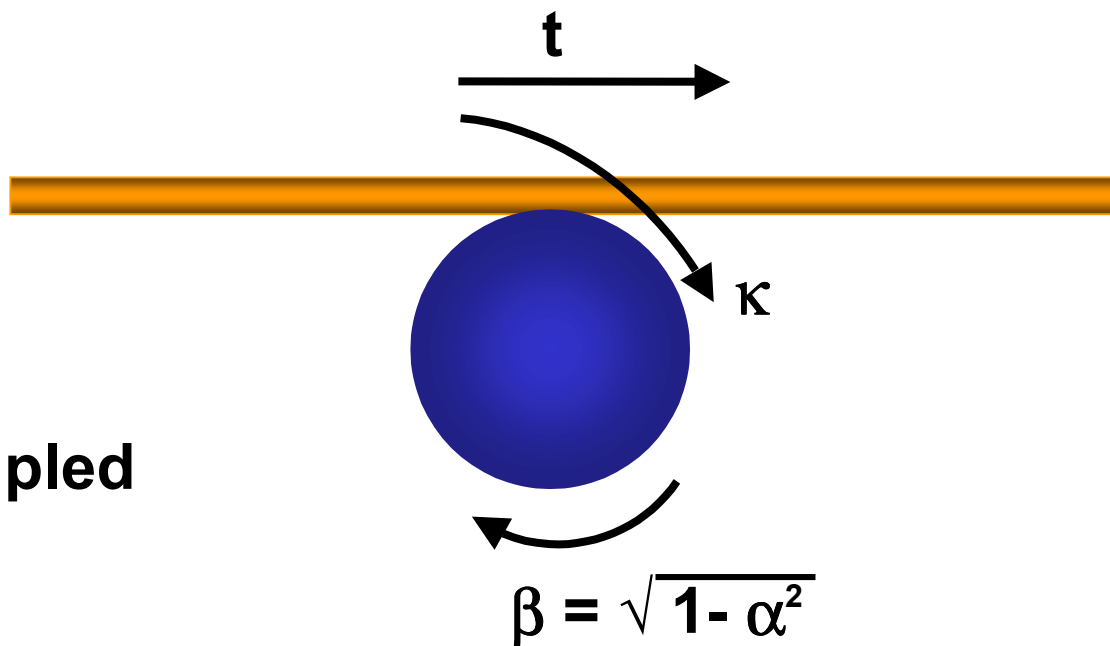
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# Coupling Regimes

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$\kappa > \beta$  **Overcoupled**

$\kappa = \beta$  **Critical**

$\kappa < \beta$  **Undercoupled**

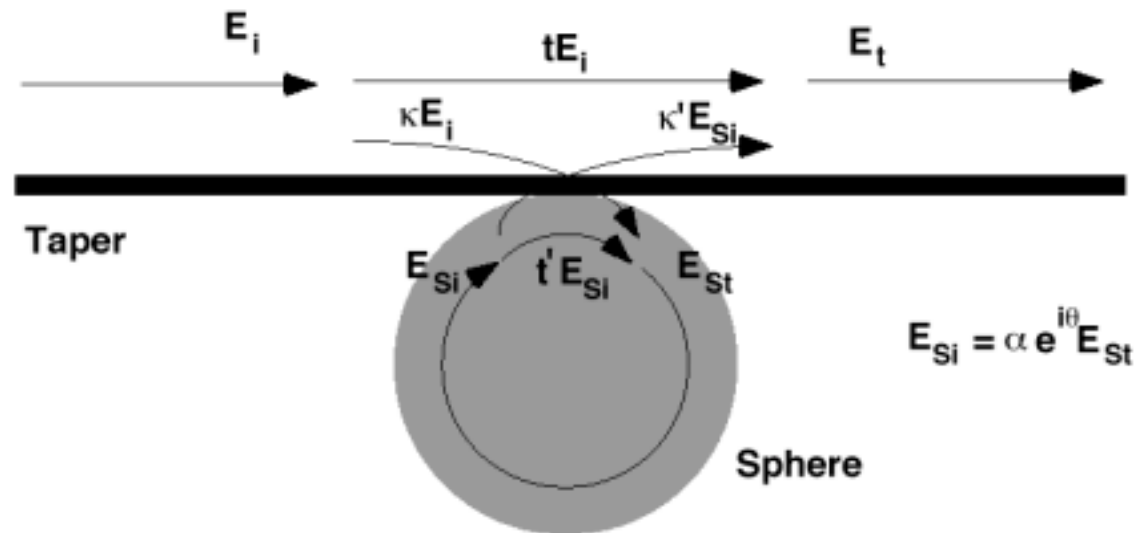
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# Coupling Regimes (Detail)

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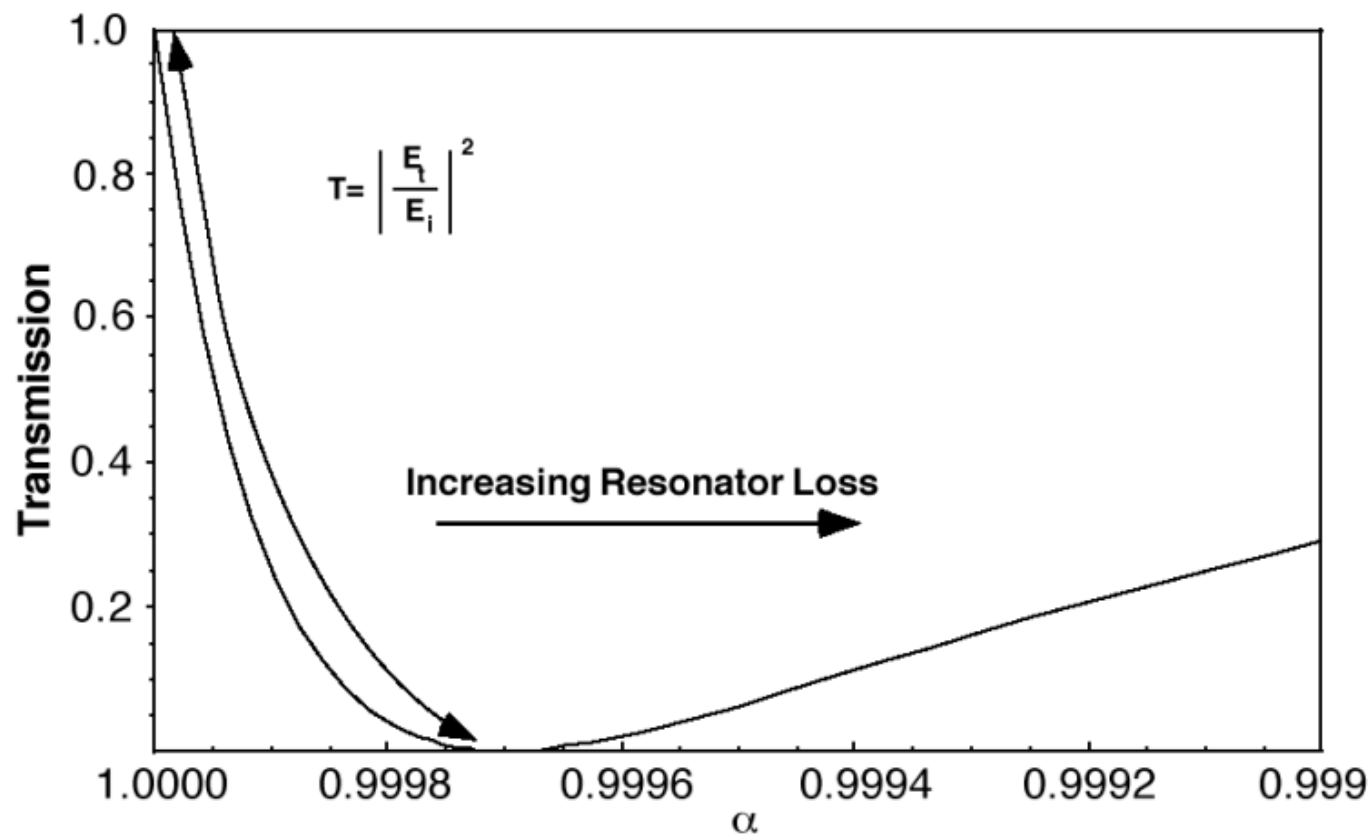


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# Variation of Regime

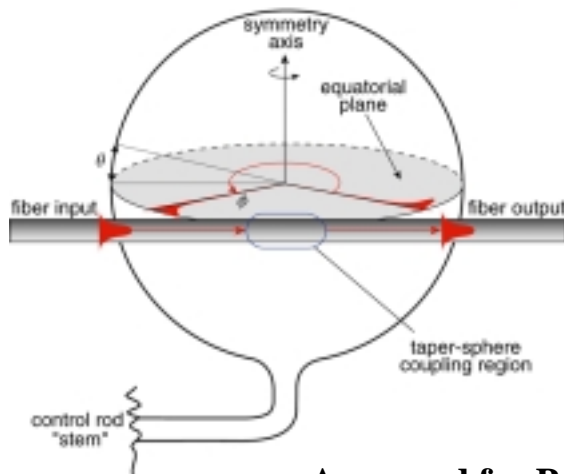
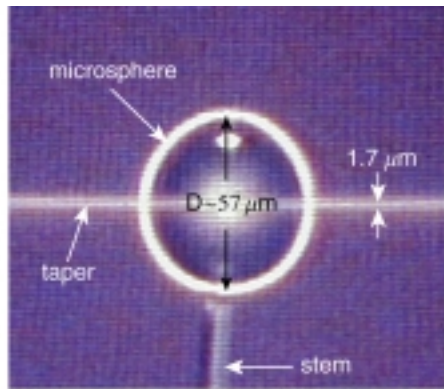


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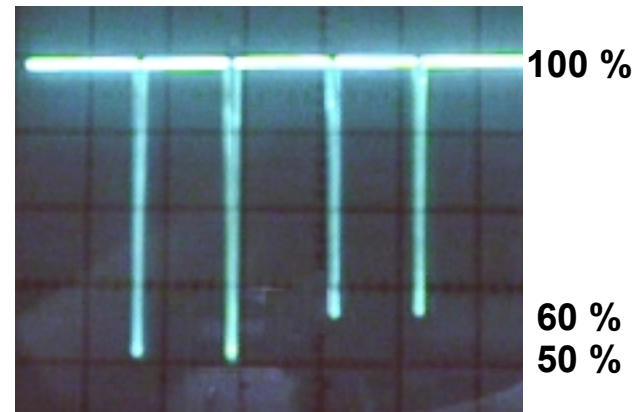
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# Fiber Taper Coupling to Microsphere WGMs



Transmission



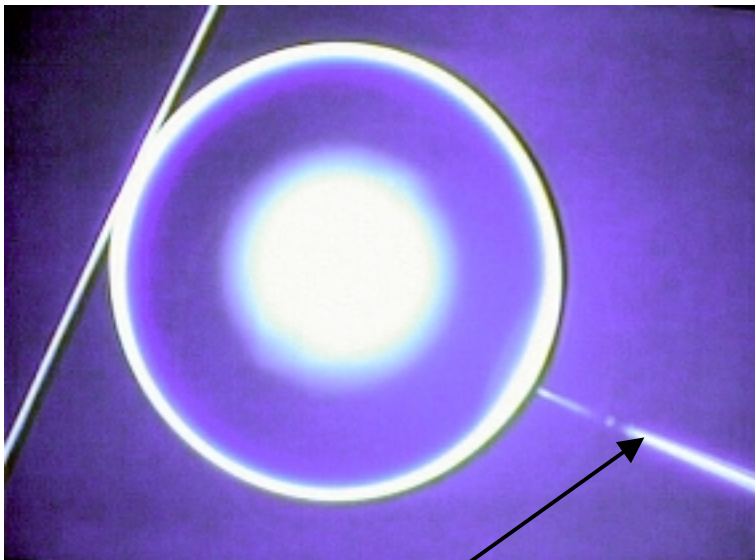
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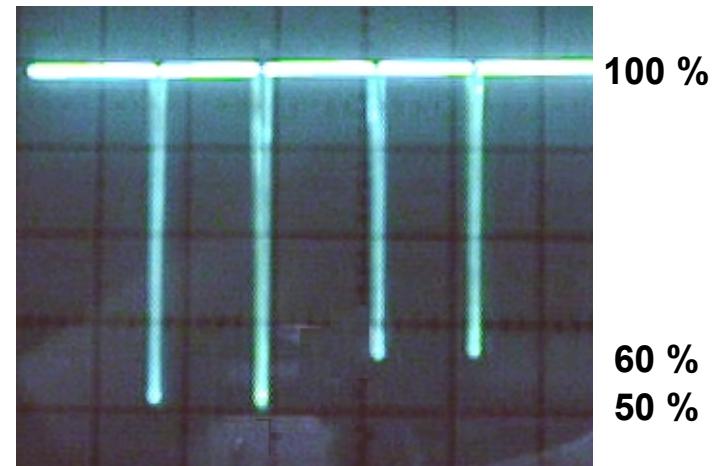
# Coupling Control: Experimental Verification

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**Microprobe**

**Transmission**



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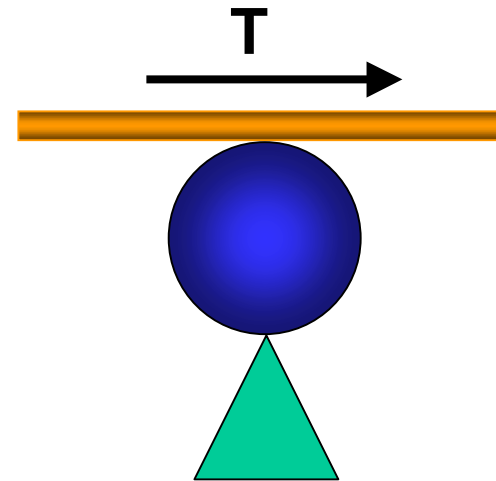
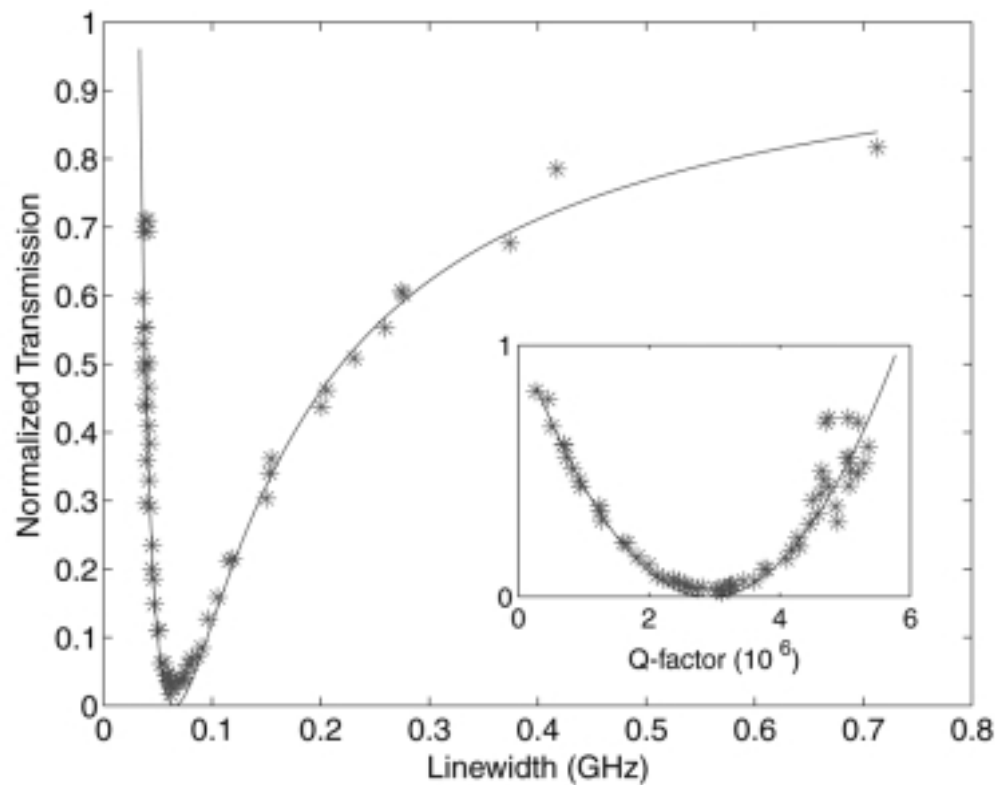
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# Variation of Coupling Regime

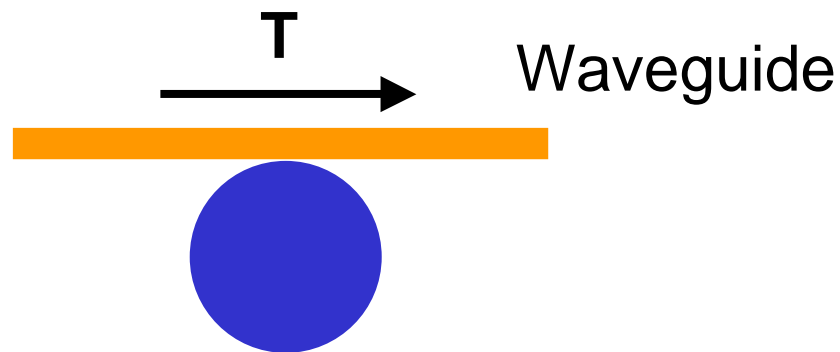
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Cai, Painter, Vahala, Phys. Rev. Lett., July 3, 2000

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# High-speed modulator for links with net RF gain



Resonator with high-speed control